GRAPHIC SCIENCE

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AN AUTOMATED DRAFTING MACHINE

NOVEMBER, 1961

GRAPHIC SCIENCE

NOVEMBER, 1961

HIS ISSUE 12,000 COPIES

VOLUME 3 NUMBER 11

The Magazine Serving Engineering Drawing Management—covering drafting, reproduction and microfilming, technical illustration, drawing standards and engineering documentation.

ARTICLES

DEPARTMENTS

COVER ILLUSTRATION—*An automated drawing machine built in 1773 by the Swiss mechanic H. L. Jaquet-Droz. It is now located in the Museum in Neuchâtel. Photograph courtesy of Franz Kuhlmann.*

Next Month

EVALUATING ELECTRICAL CONSTRUCTION DRAWINGS by Charles W. Snow
Getting drafting economies without losing needed information requires a careful examination of the function of the drawings

TRUE POSITION DIMENSIONING EXPLAINED by W. L. Wein
Many companies are missing the benefits of this method of dimensioning because of a misconception that it is complicated to use and interpret

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Notes & Comment

VCC Next Month

THE VISUAL COMMUNICATIONS CONGRESS, in its fifth year, meets in Los Angeles on December 2, 3, 4 and 5. It is well known as the best display ground for quality equipment, techniques, and supplies, and this year it will attract more than 8,000 quality executive personnel in administration, reproduction, design and documentation from every state in the union, as well as Canada, Mexico, South America, Europe, and Asia.

The Congress will be of three-fold interest to us in the drafting and reproduction field. Jointly sponsored by the Society of Reproduction Engineers, the American Institute for Design and Drafting, and the American Records Management Association, its program includes a technical session with panel discussions on various subjects of vital interest in the field; the annual national meetings of the three societies; and the exhibitions by manufacturers and distributors of products related to drafting and reproduction.

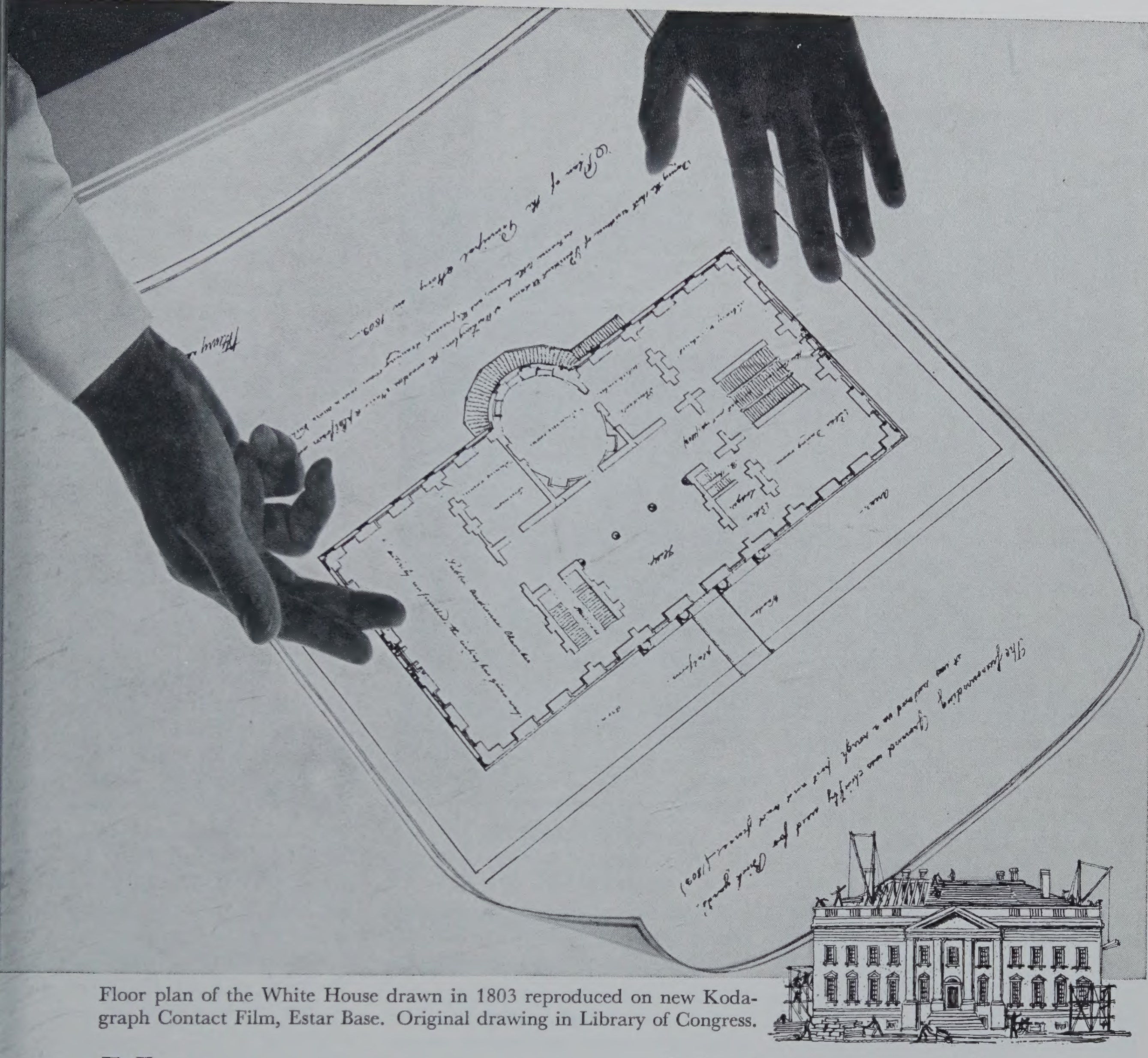
Graphic Science plans to be there, of course, and we are hoping to see many old friends, and make many new ones, at our booth—#223. See you early in December.

Microfilm Distribution

PHOTOSTAT CORPORATION has recently announced the appointment of Graphic Microfilm Corporation of New York City as a franchised distributor of its microfilm equipment and supplies.

Specialized Service

A NEW MICROFILMING service for government and industry has been announced by Fulfillment Corporation of America, a specialized service division of the Stanward Corporation of Marion, Ohio. The new service complements the company's federal cataloging work involving the preparation of item descriptions and handbooks showing millions of illustrated parts breakdowns and lists. The microfilming service will copy records, documents, etc., on 16 mm. or 35 mm. film, combine the microfilm records and the means of reproducing copies on aperture cards.



Floor plan of the White House drawn in 1803 reproduced on new Kodagraph Contact Film, Estar Base. Original drawing in Library of Congress.

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Drawing Materials and Blue Prints

by Franz Maria Feldhaus

This is the beginning of Chapter V of an authoritative and beautiful book, **THE HISTORY OF TECHNICAL DRAWING,** by Franz Maria Feldhaus published in 1959 by Franz Kuhlmann, K.G., of Wilhelmshaven, Germany, as **GESCHICHTE DES TECHNISCHEN ZEICHNENS.** We are indebted to the publisher for the translation as well as for permission to reprint this fascinating work. It will be continued in this department from month to month, until completed.—The Editors.

Originally men drew on stone, in sand or clay, and they also scratched on palm leaves, and painted lines on wood and many other materials. But the three most significant materials remain papyrus, vellum, and paper.

Papyrus was produced from the finest marrow of the papyrus bush, a tall water plant that once grew in masses in Egypt; it has now disappeared from Egypt and is now still found only in small amounts on Sicily. The small marrow skins of the plant were put in layers so that the grain crossed and made into writing material with the help of a lever press. One of the oldest papyrii was made about 3500 B.C. and is now in the national library in Paris.

During Roman Imperial rule, in the first centuries of our chronology, papyrus ceased to be used. Only the conservative papal chancellory still used it until the tenth century, when vellum took its place. The use of vellum can be traced as far back as 1400 B.C. Theophilus about 950 understood by Greek vellum, paper made from linen. A vellum maker is known to have existed about 1150 in Regensburg and during the following century a vellum maker was called Puhveller (bookfeller) because at that time vellum was mostly used for the covers of books. Many valuable pieces of vellum with script paintings or drawings were lost because they were bought up by gold-beaters and used as intermediates.

Paper originated in China, as did the hemp paper of the third century B.C. and the paper made from pieces of silk and linen discovered by Tsai-Lun in 105 A.D. This inventor must be the only person in the world to have had a temple erected in his honor for his services.

It was the Mohammedans who brought paper to Europe through prisoners taken at the battle on the Thalas in 751. Until then the Chinese had kept the making of paper a state secret, but now Chinese paper makers, as prisoners of the Arabs, made an equally good paper. In 794 a paper factory was erected in Bagdad. The oldest manuscript on German paper that we know of dates from 1228.

The Compass Smith (woodcut by Jost Amman, 1568)

Not every paper is suitable for drawing. Until a machine was invented, paper was made by hand in vats. Paper made by hand was small, but well suited to drawing because of its toughness. Hand made drawing paper, made by James Whatmann in the Springfield mill in Kent from 1770 on, became well known. Very large sheets made by hand were produced by the Chinese around 1795.

In the Hahnen Mill in Dassel, Germany, drawing paper was made quite early. A paper with a firm surface specially well suited for drawing was discovered by the watchmaker Moritz Fritz Illig in 1806 in Erbach in the paper mill of his father. Exactly when drawing paper was first made by machine is not known.

When in the eighteenth century the demand for paper increased greatly, there was a lack of the necessary rags. That is why an attempt was made to make paper out of such oddities as wasp nests, moss, hop runners, vines, mulberry leaves, and cabbage stalks. In 1844 Friedrich Gottlob Keller of Hainichen (Saxony) discovered that sawdust and wood shavings produced wood pulp. This was mixed with a mass consisting of rags and produced useful printing paper. But soon more wooden material was used and the paper became brittle and yellow. There are folded drawings in old files that have broken to pieces because the binding threads of the rags are missing.

The well-known technologist Franz Reuleaux realized the great danger of this deterioration of paper. He suggested in 1882, in a petition to the Prussian government, the founding of a paper-testing institute for controlling the fabrication of paper.

A newspaper owner, Karl Hofmann, broached the question of introducing standard papers to Bismarck in 1883. That is how paper norms, particularly for writing paper, files, and drawings came into being. The composition of the paper guaranteed durability. The various types of duplication, too, increased their potentialities during the centuries. In early times only a small circle of trained men had the technical knowledge. The contact of peoples and clans with other peoples and circles of culture—by peaceful or warlike means—however, spread this knowledge. Technical propositions could no longer be kept within a comparatively small circle. This automatically made it necessary to publish and make generally known.

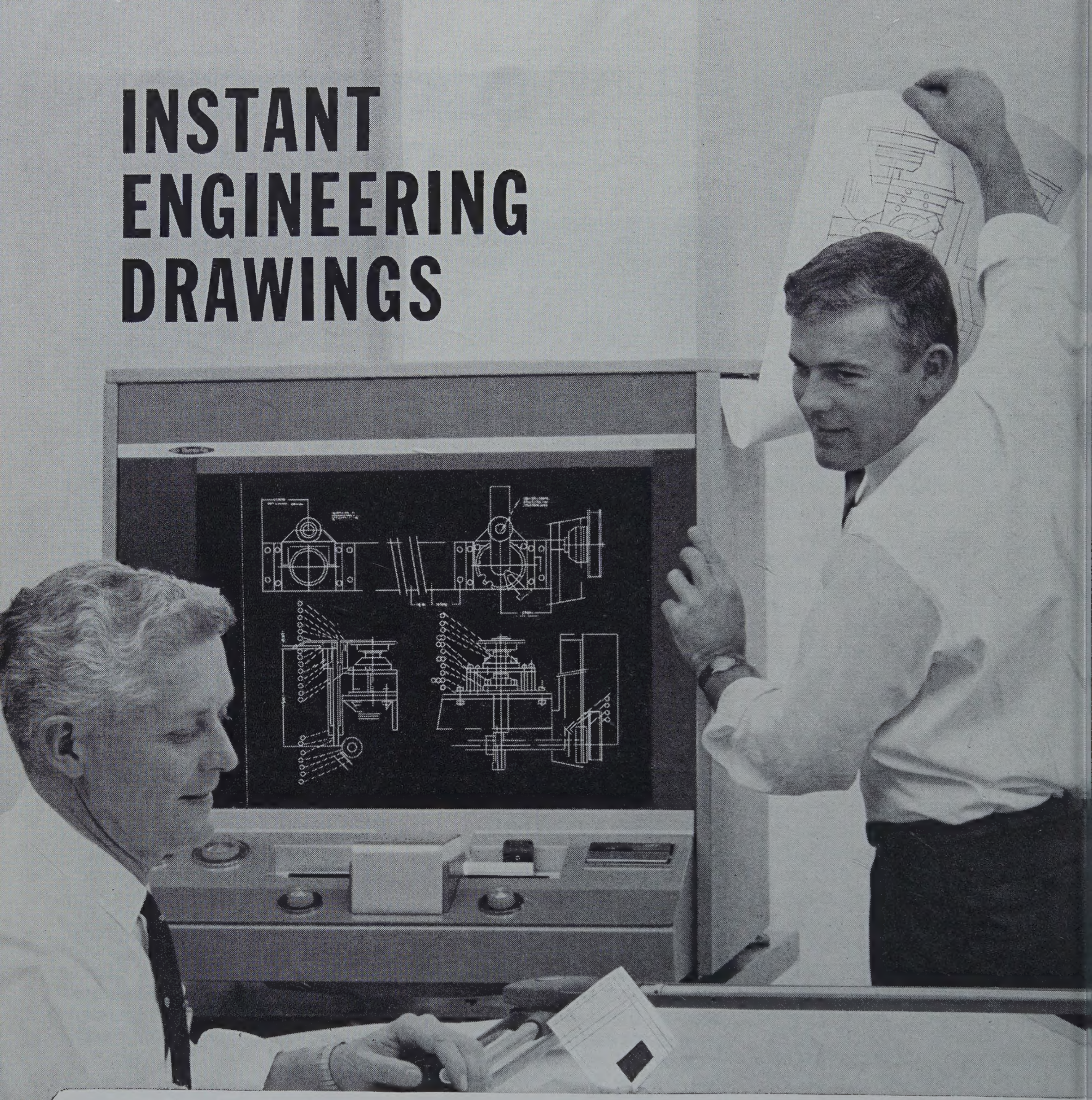
We know what effect the inven

n of typography, and with it the ility to spread thoughts, had on manity. At first there seemed to no demand for the quick duplica- ı of small editions. When neces- ry, copies of originals were made hand. The *Book on Art* by the lian Cennino Cennini mentions about the year 1400 various copy- g materials for tracing. Finely aven vellum coated with linseed gives a durable and sufficiently nsparent tracing material. Paper ated with clear linseed oil also nsparentizes paper. One can also st tracing material by pouring fish ıe onto an oiled marble slab. The in transparent skin can then easily lifted off. In recipe books one of- ı finds instructions on how the chnician himself can make tracing per. For example, in 1710 in the ok *The Gilded Gate to the Art of ire and New Curiosities* such infor- ation appears. Around 1800 one ade paper for the copying of draw- gs by dipping thin paper into a ixture consisting of two parts nut and one part turpentine oil. A od copying paper was made by achine by the Englishman Cathery, hich was recommended in Germany 1815.

A material made of fine linen or tton, and called oil pergament, ex- ed about 1800. It was coated with mixture of white lead, chalk, and ıe and saturated with oil. Quite a eful tracing linen was made in 24 by Gauvain and Spielhagen in enthin. They coated linen with a ixture of purified varnish, krimser- ite, isinglass, and finely ground bestos. On December 10, 1824, ey were given a Prussian patent d started manufacture.

After the first London world exhi- ion of 1851, tracing linen from the tent of the Englishman Charles wse (1846) became generally own as tracing cloth or vellum th. A mixture of wax and starch s used to stiffen and smooth it. Cennini also mentioned about 1400 dotting wheel for copying a awing onto an underlying page, as still know it to-day in the copy- g of dressmaking patterns. One ew the lines by tracing along the e points. In the picture, The Circle ith by Jost Amman, one can see t such a copying wheel amongst objects hanging out for sale.

To Be Continued



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GRAPHIC SCIENCE

NOVEMBER, 1961
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Marking and Color Coding Check Prints

How to reduce misunderstanding and misinterpreting of check prints and help speed release of drawings

by Robert W. Boyd

CHECK PRINTS are intended primarily to prove (or disprove) that an idea will work, that the parts will fit together as intended, and that all the information necessary to build or buy has been correctly spelled out. However, a properly marked set of check prints can furnish a great deal of useful information to many people, not just to the draftman who is going to revise the original tracings. Between the time the checker completes his original check and sends the prints to drafting to have the tracings reworked and the time the prints and tracings are returned to him for backchecking and sign-off, several people may have had occasion to review the marked prints. For example:

The engineer having designing responsibility will certainly want to review the marked prints before allowing the draftsman to make changes that may affect his design intent.

The project engineer may wish to review the job status at this point.

The drafting supervisor can evaluate the work being done by his group and at the same time estimate the time required to complete the indicated rework.

If a prototype model is already under construction, the model shop supervisor may wish to look the prints over to spot any differences from the original layout and sketch information he started with.

The purchasing agent may have sent advance prints to vendors for bids and may wish to examine the check prints to see if any serious errors have been discovered or changes contemplated that should be brought to the vendor's attention.

And finally, the draftsman who is assigned to make the revisions to the original tracings must understand exactly what each mark on the check print means.

Uniform Marking

There must be no possibility of anyone interpreting the check prints incorrectly. Misunderstanding on the part of the draftsman can increase the checker's backchecking time and delay the releasing of the drawing set. Therefore, a uniform marking technique must be adopted and understood by all who may have occasion to review or work with check prints.

After the original checker has marked his print the need may arise for others to mark on the same prints. While this is not recommended it is sometimes necessary. It must, however, be done in a manner that will not introduce confusion.

Prints

REGARDLESS of the final marking method adopted, the starting point in all cases must be a good set of prints. It might be well, at this point, to remind those not familiar with the process of checking that only prints may be marked, never the original tracings. Assuming that the prints will be blue line (or black, or brown) on a white background, they must be white enough to offer good contrast for the colors used in the marking. At the same time they must not be overexposed to the point where they are not true reproductions of the line work on the original tracings. They must not be underdeveloped, especially if they are made by an ammonia process. Underdeveloped prints will fade and discolor, and check prints should be kept on

file until the final unit of a contract is delivered. The prints should be dated, and if a release issue number or letter system is used, it must be clearly shown. The print should be identified as a check print and the responsible checker's name be clearly evident along with a notation to return the print to him.

Color Marking Code

The colors used to mark check prints should be kept to a minimum and should have a definite meaning. For example:

Red should be used to indicate what is to be changed, added, deleted, or corrected. Questionable items should also be indicated with red.

Yellow should be used to indicate what is correct as it stands and is not to be changed.

Green should be used (in place of yellow) in the backchecking process to indicate that items marked in red during original check have been completely and correctly revised.

Occasionally the responsible design engineer will find it necessary to introduce changes over and above those marked by the checker. He should, of course, explain the changes to the checker and have him mark them on the check prints. If this is not possible the designer may add marking to the prints himself, but not in red. He should select a contrasting color, such as purple or brown and date and initial the change, using the same color to identify himself and the change. This technique should also be used if the design engineer disagrees with the checker in some area. He may feel that time and his budget will not allow extensive rework, especially if the area in question is not in error but is marked in red to show a possible refinement. The designer should circle this area and label it "Do Not Do," date it and initial it with his identifying color. The draftsman doing the rework can now tell which change he is authorized to make and which areas he is to leave untouched.

The draftsman himself may wish to question some of the red marking or, if the changes are numerous, he may wish to check them over as he completes them. This he may do with a black lead pencil. He should never mark the check prints with a crayon or colored pencil.

Marking Technique

While performing the initial check, the checker must mark his prints carefully and intelligently. If he changes his mind after revising a dimension or rewording a note he will find the red crayon does not erase easily and he may wind up with a messy print. He should also consider the feelings of the draftsman who made the drawing. A lot of red on a check print usually indicates a lot of errors on the drawing. However, if the red is mainly doodling, scratched-out calculations, telephone numbers, etc., the draftsman may rightly feel his neighbors are getting the wrong impression of the quality of his work.

Small items such as missing arrowheads, decimal points, plus and minus signs, or letters in misspelled words should be circled in red to make sure they are not overlooked by the draftsman. If they are in an out-of-the-way corner, it may even be necessary to draw an arrow pointing to them.

A view or large area that must be completely revised may be sketched on a separate piece of paper and stapled or taped to the check print, preferably on the spot it will appear on the tracing. Notes may be added or existing notes altered similarly, printed on note paper and taped in place on the check print.

Dimensions to be changed should be lined out with two or three short strokes of the red crayon. This will enable anyone reviewing the check prints to see what the dimensions were before changing.

If the checker has a question or special instruction for the draftsman he should spell it out on a separate piece of paper and attach it to the check print. If, instead, he wishes to mark it directly on the print he should write it out in longhand. This will immediately caution the draftsman that it is not to be added to the tracing.

All correct dimensions and notes shall be covered with yellow crayon to indicate they are to be left unchanged. Yellow allows the linework and lettering to show through for later reference. A good lumber crayon will cover a large area without need for resharpening.

Backchecking

When the draftsman has completed all rework to the original tracings he will return the check prints to the checker along with the tracings to be signed off. Unless there were so many changes indicated that the drawing was redrawn, the checker will backcheck only what was marked in red. That is why the draftsman must never change anything that was not marked in red without first consulting the responsible checker. It could be overlooked in the backcheck. This is especially important when the draftsman makes erasures in order to move a dimension or note leader. When backchecking, the checker should use a green crayon to mark his check print to indicate that the draftsman has made each correction originally indicated in red. Should he find one that has been overlooked or not completely or correctly changed, he should circle it in red and label it "Fix" and return it to the draftsman.

Sometimes it will be necessary for someone other than the original checker to perform the backcheck. Should he find he wants additional changes he should indicate them with a noticeably different color, preferably another shade of red. He should initial the changes with the same color.

When the checker is satisfied that all corrections have been properly made, he will sign the original tracing. His checkprints should then be neatly bundled, labeled, and filed in a safe place for future reference when needed. You can be certain that need will arise, weeks, months, or even years later, long after the job has been forgotten. A properly marked set of check prints can recall an amazing amount of detail on how the job was processed during its active life.

The Author

Robert W. Boyd previous to his present position as a product design engineer with the Laboratory for Electronics, 1079 Commonwealth Ave., Boston, Mass., was for ten years chief checker with the company. He has been, since starting his career as a drafting apprentice with Gillette Safety Razor Co., draftsman with Submarine Signal Co., and partner in a drafting job shop.

A New Look at Stencil Drawings

Some problems caused by the use of conventional stencil drawings and some simple rules which will expedite accurate marking of equipment

by D. P. Simonton

ONE OF THE most neglected step-children of military electronics design is equipment marking. Engineers will hasten to tell you that they did not spend four years in college to learn the picayune details of putting numbers on chassis and terminal boards. Yet, if this job isn't done intelligently and carefully, it can become a major source of wasted time and effort on a project—not only for design and manufacture during the creation of the equipment, but also in the spare parts and maintenance phases in the field. The requirement for marking military electronic equipment is outlined in MIL-STD-16. The gist of it is this: each replaceable electrical part must be identified by a reference designation (e.g., "XV 1" tube socket number 1) marked adjacent to its physical mounting position in the equipment. Thus, if a part fails, its functional identification is unmistakably known, even after the part has been removed from its mounting. A part which is used to trim or test a circuit (e.g., a test point "J3") is also marked with a function designation (e.g., "+28 VDC") to describe its circuit function.

How It Is Usually Done

CONVENTIONALLY, engineering provides drawings which show fully delineated and dimensioned stencil information on the detail drawings of the individual chassis and solder-type terminal boards (see Fig. 2.) From this information, without adding any further interpretation, the fabrication department can prepare durable brass stencils or silk screens, affording exact reproducibility of marking for large quantities of parts. The assembly department receives completely marked chasis and terminal boards ready for immediate assembly. Simple as that. And it is a dandy system when certain conditions prevail:

a. Engineering has time to develop the design and debug it completely in the lab.
b. Drafting has time to reflect this careful design on drawings which are completely checked to catch all the errors.
c. An engineering model is built to these drawings to prove out fits and interchangeability of parts.
d. The system is comparatively small in scope and quantities are fairly high.

But Today Isn't Usual

NOBODY in the field of military electronics ever hears of such Utopian circumstances, for the following reasons:

a. Engineering is under great pressure to release circuit assemblies which haven't been completely tested out in the lab.
b. Drafting is under equal pressure to release untried drawings directly into the shop.
c. The model is the end item, and it may have to be built in the model shop by skilled model makers, or in the factory by comparatively unskilled people. The drawings can't be tailored to one or the other—they have to be suitable for either.
d. The system we're building isn't simple. It is, in fact, so immensely complex that the interdependence of its myriad parameters preclude any real finality in its constituent assemblies until system tests are fairly well complete—often in the field. Quantities aren't large and, in fact, at the time we start in, we may not even know what they will be—but let's not count on more than three or four. Additional orders won't be for the same equipment, even if we get them. They may bear the name of the same mythical Greek god (or close relative) and may look similar on the block diagrams, but the hardware will be different. You can count on that, too.

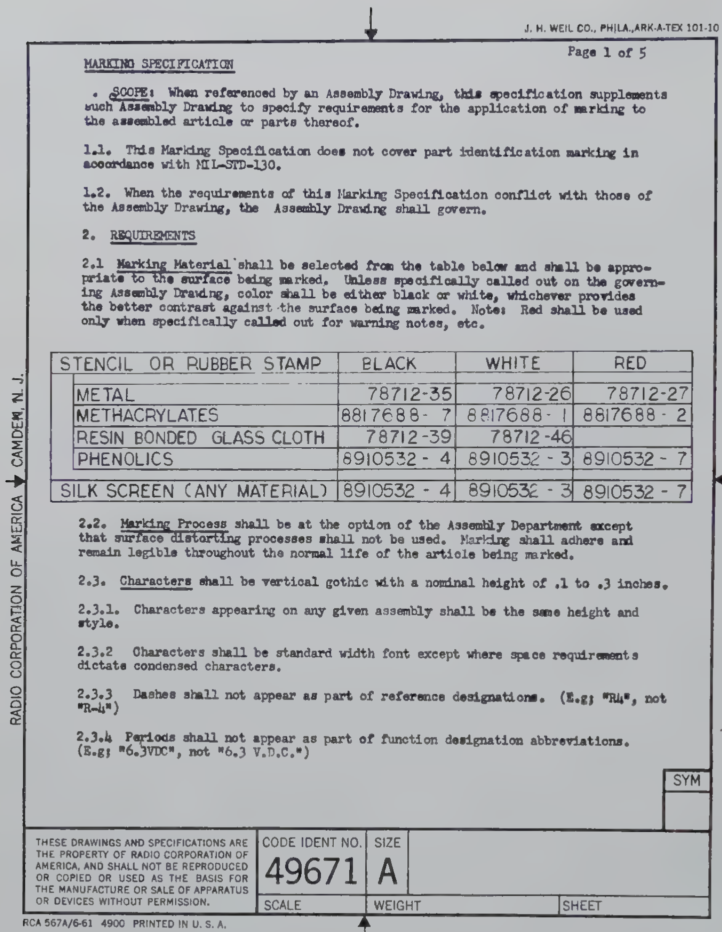
What Will Happen

EVERYBODY can stick to his guns and insist that the drawings must completely specify the marking requirement for each part, because "we've always done it that way," but here's what will happen:

Engineering and drafting will be so busy preparing this detail marking minutia that they will not have time to do a good job on technically important problems.

Since marking information is always available last, production release of otherwise complete designs will be delayed until the marking drawings are finished. If the design is released without the marking information, then fragmentary releases will get snarled up and the parts will be delayed waiting for stencils.

Once accumulated for assembly, the circuit will have undergone design changes and the markings will be wrong anyhow. Even if they read correctly, they will be in the wrong place. There hasn't been time for models to be built to determine the lay of the cables, prove out the fit of the parts, etc.


J. H. WEIL CO., PHILA., ARK-A-TEX 101-10

Page 1 of 5

MARKING SPECIFICATION

. SCOPE: When referenced by an Assembly Drawing, this specification supplements such Assembly Drawing to specify requirements for the application of marking to the assembled article or parts thereof.

1.1. This Marking Specification does not cover part identification marking in accordance with MIL-STD-130.

1.2. When the requirements of this Marking Specification conflict with those of the Assembly Drawing, the Assembly Drawing shall govern.

2. REQUIREMENTS

2.1 Marking Material shall be selected from the table below and shall be appropriate to the surface being marked. Unless specifically called out on the governing Assembly Drawing, color shall be either black or white, whichever provides the better contrast against the surface being marked. Note: Red shall be used only when specifically called out for warning notes, etc.

STENCIL OR RUBBER STAMP	BLACK	WHITE	RED
METAL	78712-35	78712-26	78712-27
METHACRYLATES	8817688-7	8817688-1	8817688-2
RESIN BONDED GLASS CLOTH	78712-39	78712-46	
PHENOLICS	8910532-4	8910532-3	8910532-7
SILK SCREEN (ANY MATERIAL)	8910532-4	8910532-3	8910532-7

2.2. Marking Process shall be at the option of the Assembly Department except that surface distorting processes shall not be used. Marking shall adhere and remain legible throughout the normal life of the article being marked.

2.3. Characters shall be vertical gothic with a nominal height of .1 to .3 inches.

2.3.1. Characters appearing on any given assembly shall be the same height and style.

2.3.2 Characters shall be standard width font except where space requirements dictate condensed characters.

2.3.3 Dashes shall not appear as part of reference designations. (E.g; "R4", not "R-4")

2.3.4 Periods shall not appear as part of function designation abbreviations. (E.g; "6.3VDC", not "6.3 V.D.C.")

SYM

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF RADIO CORPORATION OF AMERICA, AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS OR DEVICES WITHOUT PERMISSION.

CODE IDENT NO. 49671 SIZE A

SCALE WEIGHT SHEET

RCA 567A/6-61 4900 PRINTED IN U. S. A.

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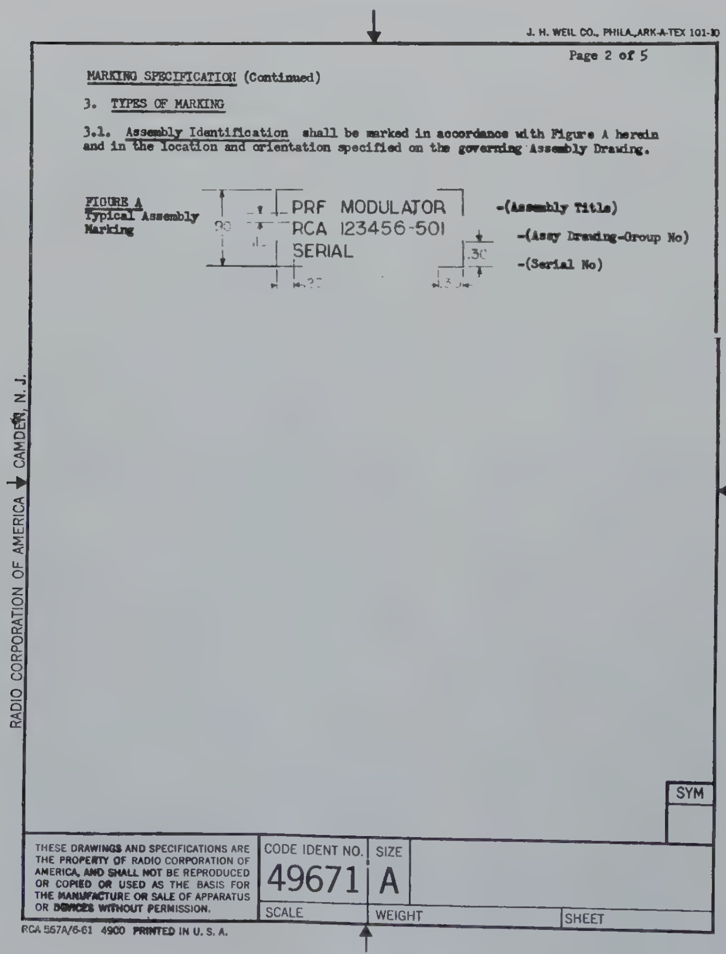
FIG. 1-Page 1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Page 2 of 5

MARKING SPECIFICATION (Continued)

3. TYPES OF MARKING

3.1. Assembly Identification shall be marked in accordance with Figure A herein and in the location and orientation specified on the governing Assembly Drawing.

FIGURE A
Typical Assembly Marking

PRF MODULATOR -(Assembly Title)
RCA 123456-501 -(Assy Drawing-Group No)
SERIAL -(Serial No)

SYM

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FIG. 1-Page 2

What To Do Instead

Let's start by making a pair of simple rules to go by:

1. Information in which errors may be found and corrected only by engineering should be shown in detail on individual formal drawings, (e.g., electrical part application, material, and finish selection, etc.).
2. Information in which errors may be found and corrected by assembly[1] methods should be spelled out in general rules on a centrally referenced standard drawing, and left off individual drawings (e.g., marking of reference designation on chassis and terminal boards).

What Does This Mean

The marking specification is a carefully worked-out standard drawing which invokes general rules for applying marking on chassis, solder-type terminal boards, and wire markers. Within the limits of these rules, it is left up to assembly methods to determine the exact location and method of application of the marking. The primary requirement being that it is permanent and legible. The use of this drawing can go a long way toward standardizing the marking on the final equipment and still give the manufacturing department freedom and flexibility to do the marking in the most efficient way, and at the most convenient time during the manufacturing cycle. A sample marking specification is shown in Fig. 1.

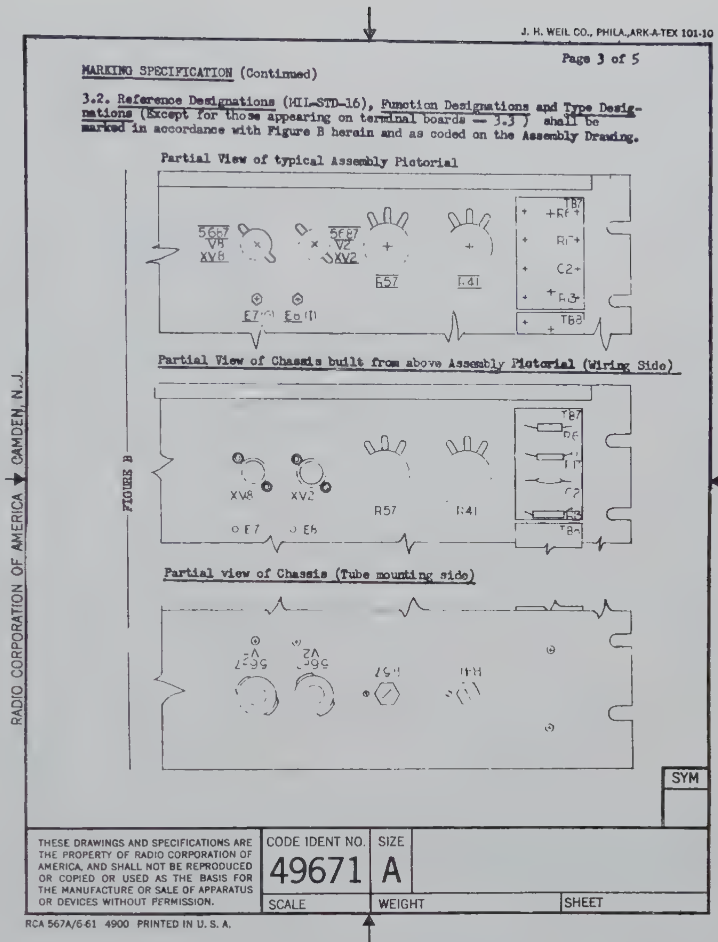
Chassis and terminal board detail drawings do not indicate any marking requirements whatever, either directly or by reference to separate ancillary stencil drawings. The advantages of this arrangement go far beyond the elimination of the drafting of these extra marking drawings for each part, and the subsequent necessity for changing them to reflect changes in circuit configuration. Traditionally, efforts to standardize chassis and terminal board parts for each project have been thwarted by the necessity for each of these as-marked parts to be assigned a part number which completely and peculiarly identifies it. Even when parts are physically identical, different markings (no two terminal boards, for example, have

[1] RCA's Production Department consists of two basic groups: fabrication (material cutting, forming, and finishing) and assembly (putting together, wiring, and testing).

the same marking) have required the preparation of separate drawings, peculiar listing on each list of material, separate ordering, setups, inspection, material handling, stocking and accumulation. The use of the marking specification, on the other hand, encourages hitherto impossible standard stocking and permits bulk handling right up until the marking is actually applied—at the last possible minute before assembly and wiring. On several major projects, it has been possible to reduce the number of different standard solder-type terminal boards to six—orderable thousands at a time.

There is no longer the problem of trying, for example, to accumulate parts for an assembly including seven physically identical terminal boards and finding that six of them are in stock, but the seventh is incorrectly marked (or hasn't been delivered because of incorrect marking). No more special expediting back through fabrication. No more jury-rigged rework facilities in assembly, because under the marking specification system, marking is an assembly operation. If quantities or schedules make marking more feasible in fabrication, then an arrangement between assembly and fabrication may be made, but this will not require special engineering drawings nor engineering changes to keep them correct.

The assembly pictorial (see Fig. 1.B) provides the key to the over-all method. The electrical part reference designations serve a dual function: 1) they locate and identify each electrical part by direct reference to the electrical list of material item number; 2) they indicate, by the marking specification code convention, the physical marking to be applied to the equipment, thus: A line beneath the reference designation ("EI") means *mark nearside*; "VI"—*mark farside*; "JI"—*mark near and farside;* "GND 1"—do not mark. The code is not used on terminal boards, since all reference designations appearing there are to be marked nearside. The location is relative only, the exact position being left up to assembly methods. If they guess wrong (and they are much less likely to do so than drafting,) then they are in a position to fix it informally without bothering engineering, drafting, production control or anyone else. The only requirement is that it be perma-


J. H. WEIL CO., PHILA., ARK-A-TEX 101-10

Page 3 of 5

MARKING SPECIFICATION (Continued)

3.2. Reference Designations (MIL-STD-16), Function Designations and Type Designations (Except for those appearing on terminal boards — 3.3) shall be marked in accordance with Figure B herein and as coded on the Assembly Drawing.

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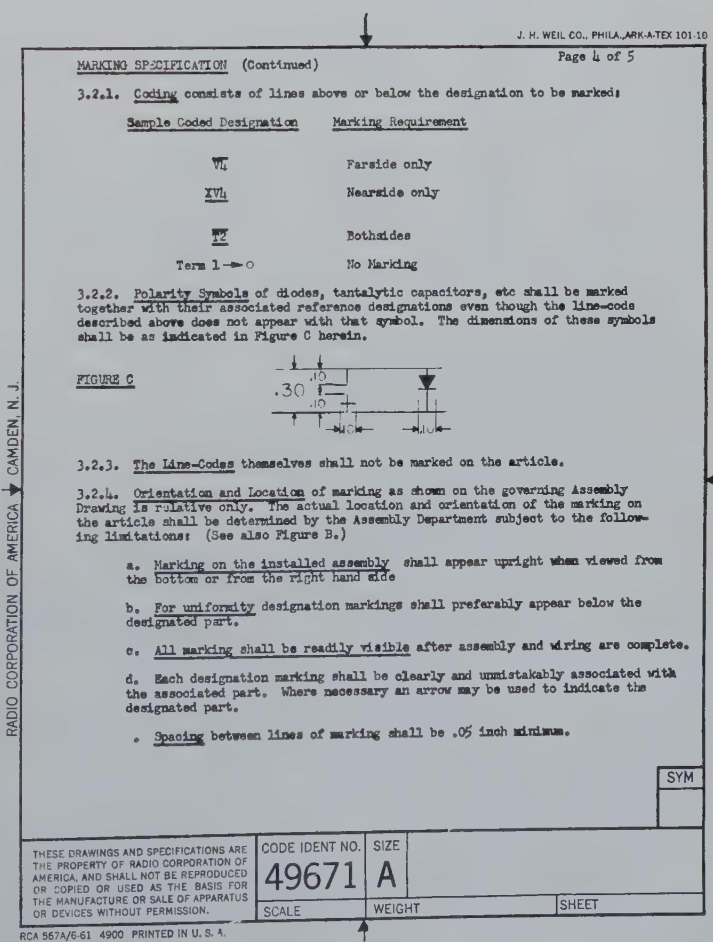
CODE IDENT NO.	SIZE	
49671	A	
SCALE	WEIGHT	SHEET

RCA 567A/6-61 4900 PRINTED IN U. S. A.

FIG. 1-Page 3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Page 4 of 5

MARKING SPECIFICATION (Continued)

3.2.1. Coding consists of lines above or below the designation to be marked:

Sample Coded Designation	Marking Requirement
$\overline{\text{V4}}$	Farside only
$\underline{\text{XV4}}$	Nearside only
$\overline{\underline{\text{T2}}}$	Bothsides
Term 1 → o	No Marking

3.2.2. Polarity Symbols of diodes, tantalytic capacitors, etc shall be marked together with their associated reference designations even though the line-code described above does not appear with that symbol. The dimensions of these symbols shall be as indicated in Figure C herein.

FIGURE C

3.2.3. The Line-Codes themselves shall not be marked on the article.

3.2.4. Orientation and Location of marking as shown on the governing Assembly Drawing is relative only. The actual location and orientation of the marking on the article shall be determined by the Assembly Department subject to the following limitations: (See also Figure B.)

a. Marking on the installed assembly shall appear upright when viewed from the bottom or from the right hand side

b. For uniformity designation markings shall preferably appear below the designated part.

c. All marking shall be readily visible after assembly and wiring are complete.

d. Each designation marking shall be clearly and unmistakably associated with the associated part. Where necessary an arrow may be used to indicate the designated part.

. Spacing between lines of marking shall be .05 inch minimum.

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SYM

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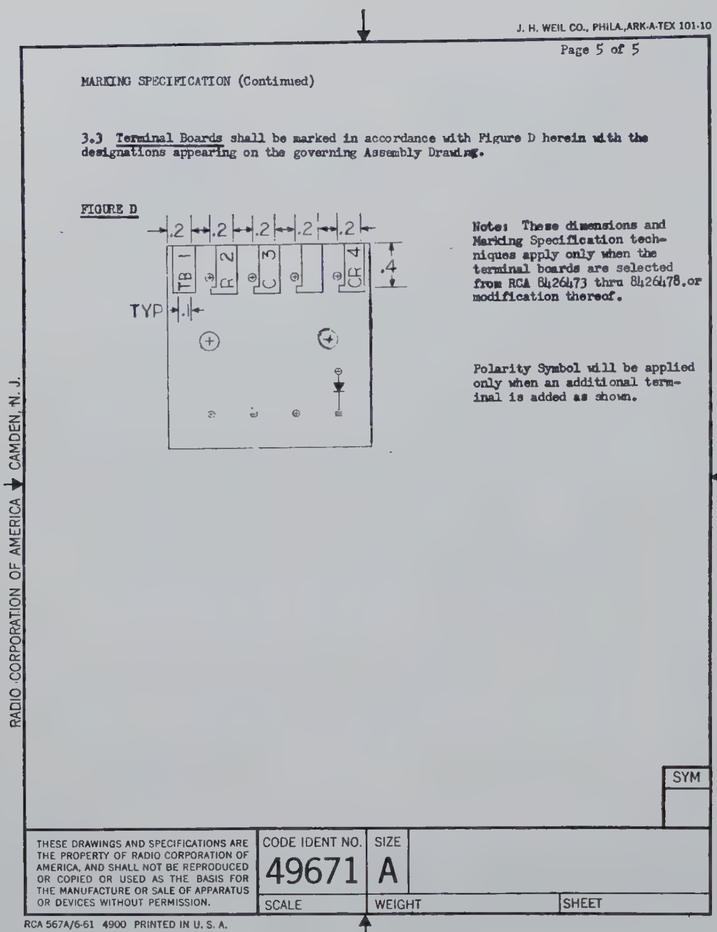
FIG. 1-Page 4


J. H. WEIL CO., PHILA.,ARK-A-TEX 101-10

Page 5 of 5

MARKING SPECIFICATION (Continued)

3.3 Terminal Boards shall be marked in accordance with Figure D herein with the designations appearing on the governing Assembly Drawing.

FIGURE D

Note: These dimensions and Marking Specification techniques apply only when the terminal boards are selected from RCA 8426473 thru 8426478.or modification thereof.

Polarity Symbol will be applied only when an additional terminal is added as shown.

RADIO CORPORATION OF AMERICA CAMDEN, N. J.

SYM

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CODE IDENT NO.	SIZE	
49671	A	
SCALE	WEIGHT	SHEET

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FIG. 1-Page 5

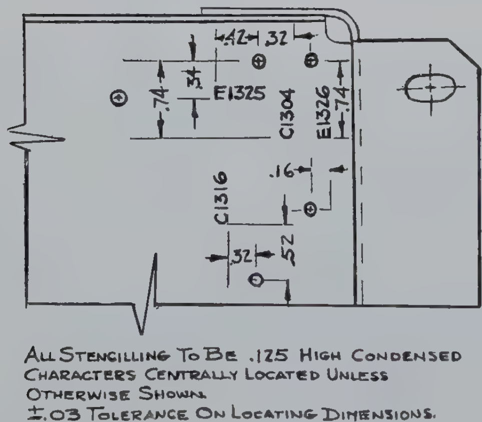


FIG. 2—Partial view of a typical chassis marking drawing using conventional drafting techniques.

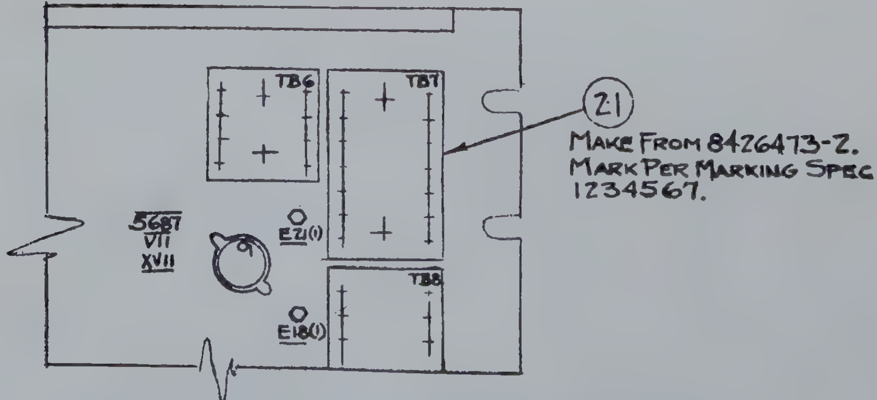


FIG. 3—Partial view of a chassis-mounted terminal board using marking specification technique and preserving unique part identification numbering of the terminal board.

nent, legible, and unmistakably associated with the part it identifies. Function designations (e.g., "AGC Output") are similarly handled. In any case where location is critical from an engineering standpoint, the marking specification may be overridden (or supplemented) by exact dimensioning.

Incidentally, where chassis are of open, uncrowded construction and lead lengths are not critical, the assembly pictorial may also show the location of major cable runs and preclude the need for the conventional wiring diagram. Thus this one drawing serves a threefold purpose: 1) assembly parts location pictorial, 2) marking (stencil) diagram and 3) wiring line diagram.

The list of material for each assembly itemizes the marking specification, the unmarked chassis, and a bulk quantity of unmarked terminal boards. Other electrical and mechanical parts may be itemized as usual.

If logistics requirements demand unique part numbering for each item as marked, this identification may be provided by treating parts marked at assembly (i.e., chassis and terminal boards) as detail assembly items. The assembly pictorial shows the item marking-coded as described above, but rather than referencing the part number of the unmarked part, the pictorial find number carries the note "Make from (unmarked part number). Mark per (marking spec. number)." The complete, unique part identification of the marked part is then "(list of material drawing number)—(item find number)." See Fig. 3.

Stencil drawings and tabulations of terminal board markings will not exist.

"But you're only handing your marking problems along to the methods people," is the standard argument against this over-all arrangement. It goes on to point out that assembly methods engineers are paid a higher rate than draftsmen, and therefore, it will waste money. This is oversimplification. The real savings lie with engineering (a sixth of the usual engineering drawing changes can be eliminated), production control (handling the engineering change paperwork, routing rework and ordering all different terminal board part numbers) and material control (stocking and handling the many different numbered parts).

The use of conventional methods, causes drafting costs to become even higher after initial drawing preparation, because of the formality which necessarily surrounds the revision of released drawings. And assembly methods must expend about the same amount of effort either way. After initial release, most of the detail marking problems (location, legibility, orientation, etc.) are discovered and solved by assembly methods. At the time of approval of the first piece assembly, all these discrepancies must be noted and corrected to look like the assemblies, rather than the other way around. Effectively, design engineering must write a change notice to tell manufacturing to do what manufacturing has told engineering to tell them to do!

It makes more sense for inspection of the marking on the finished articles to be done to the general, intent-type requirements of the one standard marking specification, which effectively translates MIL-STD-16 directly into manufacturing drawing language, rather than to the inch-for-inch requirements of the many individual marking drawings plus MIL-STD-16 anyway. Consistency of marking from one assembly to the next is much more readily assured when it is specified from one centrally referenced standard drawing, rather than from as many different marking drawings as there are parts.

Even when using parts which have been conventionally marked, the assembly department has to have some kind of marking facility to do short-order rework on the assembly floor. With a little more facilitation, this marking installation can handle the whole job. They don't have to gild the lily either; the primary requirement for reference designation marking is clarity, not beauty. With a little care and experience, rubber stamping can replace silk screening and stencilling, which for very small quantities are time consuming and expensive methods, and not really necessary.

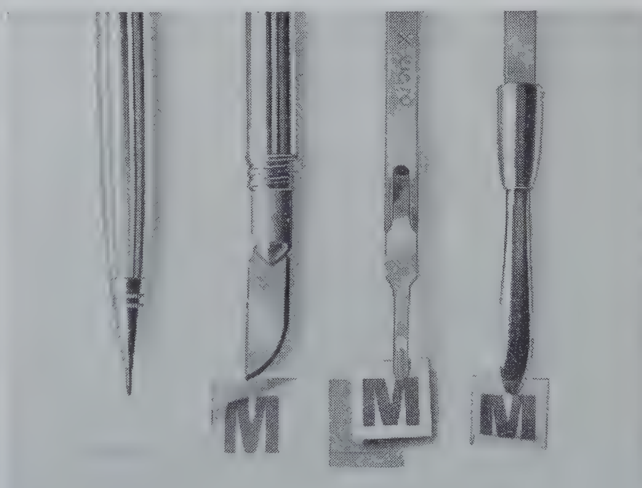
The unit numbering system of MIL-STD-16B lends itself particularly well to this method of marking. The classical block numbering system yields reference designations in the form "R2101" or even "XDS2101" (seven digits), while abbreviated unit reference designations more typically appear "R1", or at the very worst "XDS99" (five digits). Thus, a fairly small number of different peg stamps can be used to cover almost all of the marking requirements. If terminal boards can be standardized so that terminal spacings are consistent, one simple fixture will suffice to slug-stencil or rubber stamp all of them.

Model-Shop-ization

As the trend away from black-box designs is accelerated in the military electronics field, there is increasing pressure on large-scale manufacturers to discard the "idiot system" which characterized their mass quantity, halcyon days, and made their efficient production lines possible, and to adopt a system more suitable to short-order manufacturing. Few of us are in the black-box business any more.

The Author

D. P. Simonton is manager of design support services at RCA's Missle and Surface Radar Engineering Plant in Van Nuys, Calif.



AUTOMATED DRAFTING MACHINE

New tape controlled machine will do drafting, lofting, scribing, plotting, and production tape verification from mathematical formulae

EKSTROM, CARLSON & CO., of Rockford, Illinois, announces their Model No. 700 Tape Controlled Engineering Machine for drafting, lofting, scribing, plotting, and production tape verification. This new and revolutionary machine was conceived to facilitate total use of mathematical formulae heretofore primarily prepared for use in the processing of control tapes for production machine tools.

Control System

The control system will accept the coordinate description of an aircraft, missile or other vehicle component (or a part of any other product, the shape of which can be mathematically defined) prepared and coded on punched tape by a digital computer and peripheral equipment, and the machine will accurately prepare an engineering drawing of such a part or assembly up to 60″ x 144″ in size in a continuous operation.

It can produce solid or broken lines on standard types of drawing materials, such as vellum, glass cloth and the like with drawing instruments, and scribe metallic or plastic coated surfaces with scribing tools in the X-Y plane. Provision can also be made for producing drawings and plots in the X-Z and Y-Z planes.

Verification of tapes prepared for use on production machine tools can be made before such tapes are released to production thereby saving a great deal of time and eliminating possible scrapping of parts due to a programming error.

The machine is unique in that the drawing surface is in a plane 10° off vertical. This provides maximum accessibility to the drawing surface with resultant ease of loading and excellent visibility of the drawing. It likewise contributes to cleanliness and conservation of floor space.

Drawing Surface

The full drawing surface area is serviced by a complete vacuum system so valved that drawings of less than full size, or a number of such drawings, can be mounted at one time without need of masking. In the case of vacuum failure, the machine will "fail-safe" and stop. The design, machine finish, and audible noise level are compatible with other data handling and digital computing equipment for office installation.

The machine components are constructed of light weight metals with ample section to avoid distortion during the performance of the operations for which the machine is intended. The travelling column (X axis) and the drawing tool holder slide (Y axis) are equipped with unit type self-contained recirculating anti-friction roller bearings operating on hardened and ground steel ways.

Additional Features

Manual data input; scale selection for producing drawings 1/4, 1/2 and 2/1; the ability to produce mirror image drawings; electronic digital position indicators for simultaneous position readout of both the X and Y axes from drawing zero reference point or machine reference point are some of the additional features available. The current production models have a drawing area 60″ x 144″ and a line drawing speed of up to 120″ per minute.

The machine can also be supplied to verify ½″ wide magnetic computer tape. For detailed information write to: Ekstrom, Carlson & Co., Dept. GS, 1400 Railroad Avenue, Rockford, Illinois.

Application of Graphics to Engineering Design Problems

Some challenging examples of how graphics are used in the practical solution of engineering problems

by P. G. Belitsos

GRAPHICS OF MULTIPLANE RIGID METAL TUBES FOR JET ENGINES

Conclusion of a Series

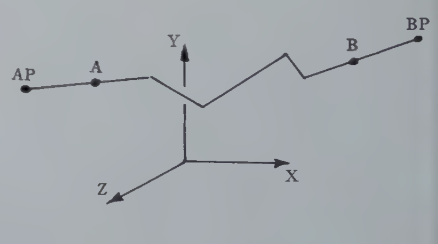
This paper was presented at the Summer Conference on Graphics in Scientific Engineering held at the University of Detroit, July 18, 1960 by the National Science Foundation.

THUS FAR we have illustrated the basic principles involved in the graphical representation and contour control of multiplane tubes. Although the examples have been relatively simple, the actual tubes in jet engine design are often quite complicated, involving bends in a large number of planes as shown earlier in Figs. 1 and 2. You can appreciate that the graphics involved in representing these complicated configurations involve a considerable number of engineering man-hours. During the development of many of the early models of jet engines it became obvious that the lengthy cycle time required to prepare the design layout and completely detail the hundreds of rigid metal tubes used on engines must be drastically reduced. This became urgent when engines for supersonic flight were first being conceived and the development cycle for a complete engine program was compressed into one-half the normal time. Studies were therefore initiated to determine possible means of making use of electronic data-processing equipment to achieve the reduced cycle time in developing the external configurations design of jet engines.

COMPUTER PROGRAM

THE GRAPHICS involved in the development of a multiplane rigid tube were analyzed and reduced to a series of mathematical equations and the entire program was written in Fortran for an IBM 704 computer. The mathematics involved in this program were developed by our computations section which derived a series of basic equations for the various parts of the program. The program consists of six major independent parts which may be run separately or combined. First let me give a brief outline of the six major parts of this program and then describe the powerful engineering tool which is available to configurations designers from the integration of this computer program with engineering graphics.

1. If bend data consisting of straight lengths, angles of rotation, bend angles, and bend radii are given, the program will calculate the coordinates of the tube. The coordinates of the tube are defined as the points where the extensions of adjacent straight lengths intersect.
2. If the engine port conditions are given, the program will correct the tube coordinates which have been measured from a mockup tube to meet the engine port conditions, and then it will print the corrected coordinates in the engine system. The engine ports are defined as the points on the engine which are connected by the tube. The points A and AP, which define the direction of the output engine port, and B and BP, which define the direction of the input engine port, are transformed into a system with the origin at A, the X direction from AP to A, and the Y direction determined by B. The coordinates of the tube are then rotated into the engine port system by using the coordinate transformation subroutine.



3. The program will calculate bend data, arc lengths, and the developed length for the complete tube from an input of tube coordinates and bend radii, or from the above corrected coordinates of part 2.
4. The program will transform coordinates into a system defined by any three points and a point of origin. Thus, for

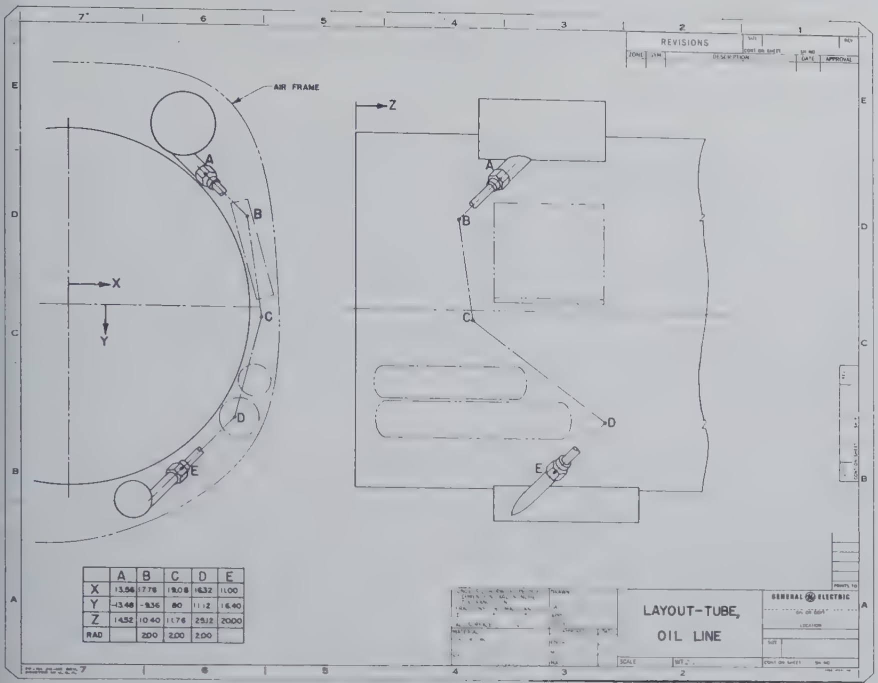


FIG. 7 SIMPLE LAYOUT OF TUBE

example, if an original layout was made establishing the coordinates using the axis of the engine, these coordinates could be transformed to a system based on any other location on the engine.

5. The program will scale coordinates. Thus, if an engine is increased or decreased in size, the program multiplies each of the coordinates for existing tubes by the scaling factor and produces new data to define the scaled configuration.
6. The program will calculate additional inspection data which is needed for multiplane tubes of certain lengths. In other words, if the straight length is less than 6″ an additional inspection coordinate point will be automatically recorded at the midpoint of the straight length. If the straight length is greater than 6″ but less than 18″ it will record two additional points on the straight length two inches from the tangent point, etc.

Method Using Graphics and Computer

The input data for this program can be obtained by two methods. The first method involves the preparation of a design layout which establishes the geometry and routing of the tube. Fig. 7 illustrates a simple layout of a tube which is routed from engine port A to E with a series of bends which have to bypass several other components mounted on the outside of the engine. The full length of the tube is defined by the end points and the intersection points of the tube, which are lettered consecutively starting with A. The direction of progression of these letters through the tube configuration is called the "run-of-the-tube." Thus the run of the tube always proceeds from point A to B to C, etc. The layout designer scales the rectangular coordinates for the five points on this tube and records these values on an input data sheet. In addition, based on the outside diameter, wall thickness, and material of the tube, the bend radii are established and recorded.

Three coordinate planes are used as the datum system for defining the tube. The intersection of these three mutually perpendicular planes form the X, Y, and Z axes. The positive direction of these axes are shown in Fig. 8. When specifying the identification and the positive direction of these coordinates the "right hand rule" is applied. When looking at the positive direction of the Z axis, the positive direction of the X axis is displaced clockwise from the positive direction of the Y axis. The coordinate axes are completely defined on the drawing by delineation or note with the positive directions and point of origin indicated.

The use of the computer program requires that the input data is based on the right hand rule. However, any arrangement of the views may be used provided this rule is applied in determining the identity and the sign of the coordinate axes. As shown in Fig. 7, the coordinate dimensions and the axes established by the layout are based on the engine axis.

In many instances the use of this axis does not lend itself to the desirability of having the detail tube defined so that a substantial portion of it lies in the plane of the paper,

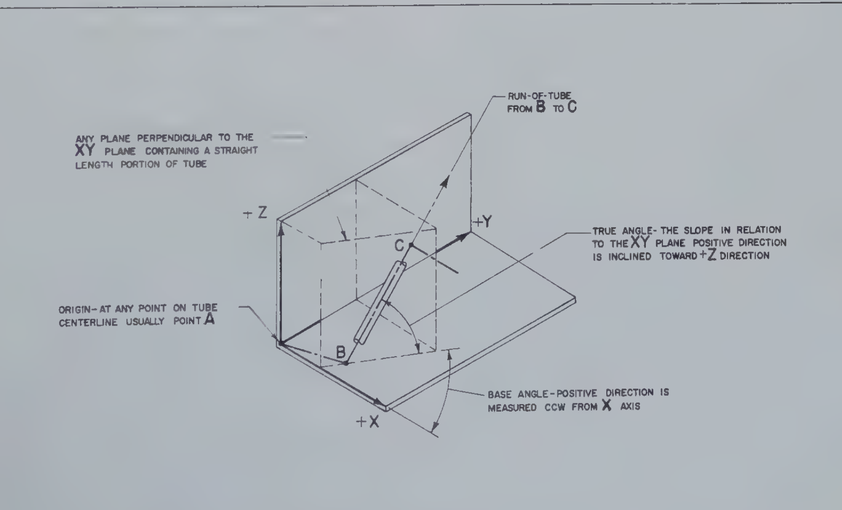


FIG. 8 GEOMETRIC FRAMEWORK

since this facilitates the manufacture and inspection of the tube. Therefore, it is often necessary to transform the original coordinate dimensions to new coordinate axes suitable for detail dimensioning of the tube. The need to transform the coordinates is recorded on the computer input data sheet. This is done by identifying the three consecutive points on the tube centerline that will be used to establish the reference plane. This reference plane either coincides with or is parallel to the plane formed by the XY axes.

This plane is selected on the basis of the following considerations: a) that it contain the largest portion of the tube; and b) that it facilitate inspection by allowing the tube to be able to sit on the surface plate in the most stable position possible. The line established by the first two points used to determine the reference plane is known as the reference axis. This line either coincides with or is parallel to the X axis. In addition, the point of origin and the first and last points of the tube must be given on the input data in order to complete the data required to transform the coordinates.

When the input data sheet is completed, it is submitted to the computations section. The data is keypunched on cards and after the computer has completed the program, the resulting output data is returned to the engineering drafting section. A simplified drawing of the same tube which is defined by the detail drawing shown in Fig. 4 is now prepared as shown in Fig. 9 which records the data defining the tube. You will note that only the two principal views of the tube are shown, using only the centerline of the tube for delineation purposes. The XYZ axes are taken at point A as the point of origin. All of the auxiliary views required to develop, delineate, and dimension the straight lengths, bend angles, and angles of rotation in Fig. 4 have been eliminated. All of this data is now provided by the computer. In addition to specifying in tabular form the transformed XYZ coordinates, the drawing may record the following additional useful data which is also provided by the computer:

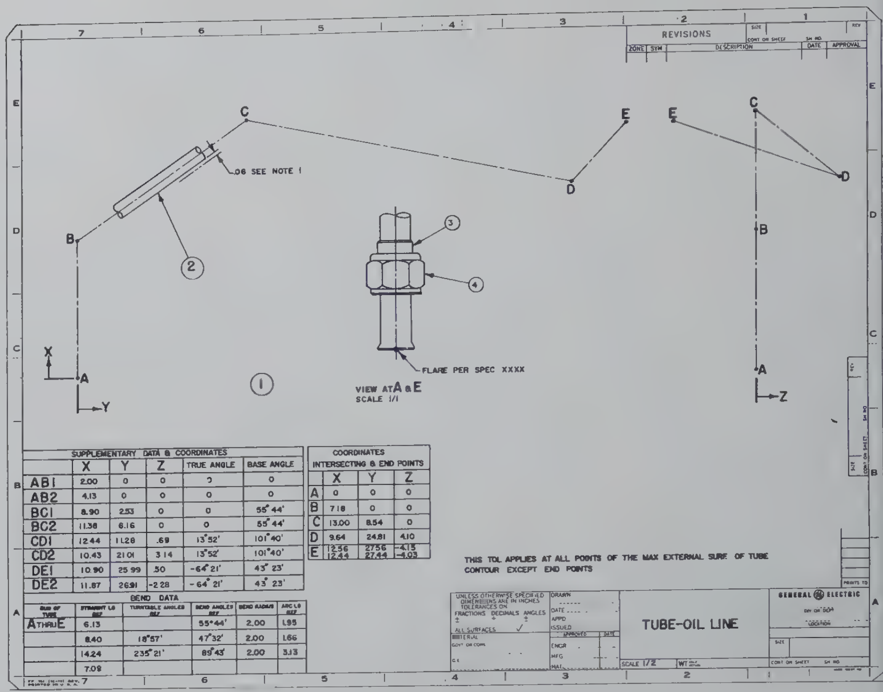


FIG. 9 DETAIL DRAWING OF TUBE (NEW METHOD)

1. Supplementary Data and Coordinates. This includes the XYZ coordinates for the intermediate points on the straight lengths needed for inspection purposes. This data is illustrated in Fig. 9. For example, points CD1 and CD2 are two intermediate inspection points on straight length C. You will note that for each of these points the true angle and base angle are also specified. As illustrated in Fig. 8 the *true angle* is an angle between the plane established by the XY axes and a straight-length portion of the tube. This angle is contained in a plane perpendicular to the XY plane. This angle is measured consistent with the run-of-the-tube so that a positive angle indicates that the run-of-the-tube is inclined towards the positive direction of the Z axis. A negative angle indicates that the run-of-the-tube is inclined towards the negative direction of the Z axis. As illustrated also in Fig. 8, the base angle is an angle in the plane established by the XY axes between the X axis and the intersection of a perpendicular plane containing a straight-length portion of the tube. This angle is measured counterclockwise from the X axis.
2. Bend Data Information. This includes all of the data required to manufacture the true configuration of the tube such as the straight lengths, angles of rotation, and bend angles as illustrated in Fig. 9.

Method Using Mockup and Computer Program

The second and most recent method for obtaining input data for the program has a considerable potential for the future. In its present state it comes close to eliminating the need for a graphical design layout to establish the geometry and routing of the tube. It requires the use of a full-scale mockup of the engine which is normally available when the configuration design is ready to be finalized and checked out. Tubing that is made of a material that is relatively easy to form is taken to the engine mockup (or to an actual engine if it is available) and bent to shape by hand and routed between the engine ports under the direction of a configurations design engineer.

The resulting tube is measured and recorded on the computer data sheet in the form of: a) straight lengths, bend angles, and angles of rotation; or b) coordinates to each of

GENERAL ELECTRIC

REV NO.	TITLE	CONT ON SHEET	SH NO
	TUBE-OIL LINE		
CONT ON SHEET / SH NO.	FIRST MADE FOR		

SUPPLEMENTARY DATA AND COORDINATES

POINT	X	Y	Z	TRUE ANGLE	BASE ANGLE
AB1	2.00	0.00	0.00	0°00"	0°00"
AB2	4.13	0.00	0.00	0°00"	0°00"
BC1	8.90	2.53	0.00	0°00"	55°44"
BC2	11.38	6.16	0.00	0°00"	55°44"
CD1	12.44	11.28	.69	13°52"	101°40"
CD2	10.43	21.01	3.14	13°52"	101°40"
DE1	10.90	25.99	.50	-64°21"	43°23"
DE2	11.87	26.91	-2.28	-64°21"	43°23"

COORDINATES INTERSECTING & END POINTS

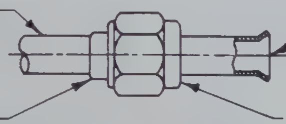
PT	X	Y	Z
A	0.00	0.00	0.00
B	7.18	0.00	0.00
C	13.00	8.54	0.00
D	9.64	24.81	4.10
E	12.56 12.44	27.56 27.44	-4.15 -4.03

REVISIONS

BEND DATA

RUN OF TUBE	STRAIGHT LG REF	TURNTABLE ANGLE REF	BEND ANGLE REF	BEND RADII	ARCLG REF
A THRU E	6.13 8.40 14.24 7.09	0°00' 18°57' 235°21'	55°44' 47°32' 89°43'	2.00 2.00 2.00	1.95 1.66 3.13

MATL: SPEC XXXX
.75 OD X .035 WALL
DEV LG 42.60 (REF)



FLARE BOTH ENDS
PER SPEC XXXX

SLEEVE XXXX-1
2-REQ'D

NUT XXX-1 2-REQ'D

VIEW AT BOTH ENDS (A AND E)

4 SEE SPEC XXXX FOR INTERPRETATION OF DRAWING AND DEFINITION OF TERMS

3 REFERENCE AXIS IS ESTABLISHED BY POINTS A-B

2 REFERENCE PLANE IS ESTABLISHED BY POINTS A-B-C

1 AN .06 TOL APPLIES AT ALL POINTS ON THE MAX EXTERNAL SURF OF TUBE EXCEPT END POINTS

FIG. 10 DETAIL DRAWING OF TUBE WITHOUT DELINEATION

PRINTS TO

MADE BY — APPROVALS — DIV OR DEPT — LOCATION — CONT ON SHEET — SH NO

ISSUED

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the intersecting points of the bends. These measurements can be made by any one of several methods that are generally used. One effective method makes use of a telemicrocope, which is a miniature alignment-type telescope mounted on a height gage. The tube is clamped on a V-block which is mounted on a surface plate and with the aid of the "telemike" the axis and intersecting points of the straight lengths can be aligned and the required measurements established.

At the same time that the tube is being routed on the mockup and measured, a partial layout is usually made that establishes the location and angular relationship between the first and last straight lengths of the tube. This graphical layout is required in order to attain the needed accuracy for the location of these important points. The coordinates locating the end points of the tube are established in relation to either the engine axis or reference plane axis. Based on the axis selected, the angular relation is given in dimensional form between the two points on the centerlines of the first and last straight lengths of the tube. One point is the end point of the tube and the other point is on the centerline extended beyond the end of the tube. This second point can be at any convenient distance from the end of the tube as long as it is beyond the tube.

If the first and last straight lengths of the tube lie on the same straight line, the computer program for translating and converting the dimensions will not function. Therefore, the input data must be adjusted to contain an additional length not on the straight line. This additional length is not included in the final detail drawing of the tube.

As in the first method, when the input data is completed, it is submitted to the computations section and punched on cards. Any error in the data measured from the mockup tube is corrected to the more accurate data derived from the graphical layout of the end points. The compensation of this error is evenly distributed by the computer over each of the bends that make up the total length of the tube.

The output data is then used in the preparation of the final engineering detail drawing. The drawing shown in the previous figure has been further simplified to include primarily the data which is derived by the computer in tabular form. The result is a drawing without any delineation of the actual tube contour, as shown in Fig. 10. Even this advanced method is undergoing additional simplification—a further demonstration of the pace at which advancements are being made in the integration of graphics, computations, and data processing.

These, then, are some of the highlights in the evolution of the design and definition of multiplane rigid metal tubes. This evolutionary process starting from a complete layout and graphical representation of these tubes is typical of a similar process which is unfolding in many aspects of engineering design. With the increasing number of applications for data processing and use of microreproduction processes, new horizons are opening up in the field of engineering graphics. The character of our engineering drawings in this decade will undergo more revolutionary changes than in all the other years of this century combined.

The Author

PETER G. BELITSOS, supervisor of standards engineering, Large Jet Engine Department, General Electric Co., Cincinnati 15, Ohio, is a graduate of Northeastern University with a B.S. in Engineering and Management. Mr. Belitsos is a member of Society of Automotive Engineers and Standards Engineering Society. He is chairman of the SAE Aero-Auto Drawing Standards Committee, and a member of the Defense Department Drawing Practice Industry Advisory Committee, and the ASA Y14-5 Dimensioning Committee. He received SAE Technical Board Certificate of Appreciation for contributions to drafting standardization.

New Products

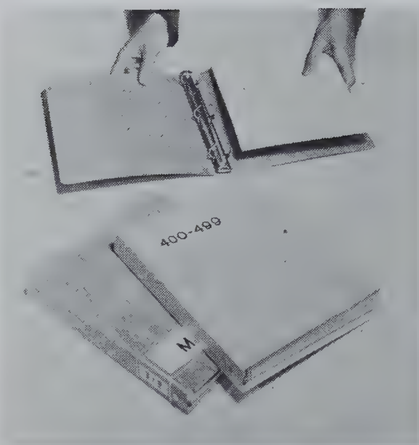
Safety Rule

New on the market is the Gladys Love Safety Rule, a new design in measuring drawing rulers, made of extruded aluminum. Made by Gladys Love Enterprises, Dept. GS, 1314 New Jersey Ave., Cape May, N. J., the rule has grooved edges for inking drawings without fear of smudging, and for allowing the use of the rule as a guide for cutting with razor blade or knife. Calibrations are easily read with standard measurements in 1/32 inch on one side, millimeters on the other.

T-shaped design makes the rulers virtually indestructible.

Pencil Point Cleaner

Dirty rags can go into the wastebasket when a Stab Me pencil point cleaner-lubricator is used. Manufactured by Oberg Manufacturing Co., Dept. GS, Deerwood, Minn., and distributed by Dietzgen (Catalog No. 3230) and Bruning (Catalog No. 37490) dealers, this new point cleaner was developed to remove the lead which adheres to the pencil point after it has been sharpened. The cleaning material lubricates the pencil point, aids in making finer, sharper lines. Stab-Me rings fit snugly around pencil sharpener base, can be used on both sides.



Ring Binder

A new model pressboard ring binder has recently been put on the market by Acco Products, Dept. GS, Ogdensburg, N. Y. The binder has rings of 1″ capacity and holds approximately 350 sheets. It is made of 20-point pressboard, with an embossed panel from the front across the spine onto the back, providing three labeling places for identification of contents. Ring mechanism is of high-quality steel, has boosters on both ends for easy opening.

Binders are available in a choice of 12 colors.

Duplicating Master

A new master unit for office and industrial duplicating that is insoluble in water or perspiration has been announced by General Binding Corp., Dept. GS, Northbrook, Ill. Designed for use with General Binding Corp.'s line of Dynacopy System duplicating machines, Rex Ultra-Clean Master Unit can be used on all fluid-type duplicators without harm to the machine. Its newly developed chemical formula is designed to eliminate staining, smudges on clothes, paper, fingers, etc.

Each master will produce more than 200 sharp-line copies, requires no special duplicating fluid or chemically treated paper.

Fixer-Lacquer

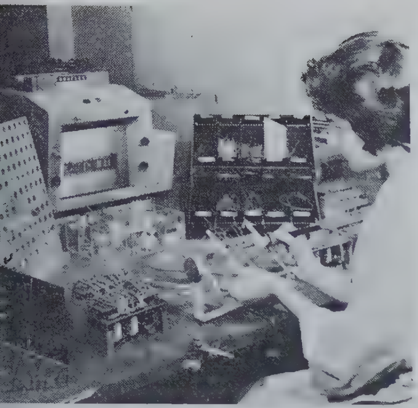
A high speed, low cost, combined fixer-lacquer for processing aluminum offset plates imaged by the photocopy process has been developed by Agfa Inc., Dept. GS, 516 W. 34 St., New York, N. Y. According to Agfa, the new product provides sharper images, finer detail, better solids, and greater safety latitudes than previously available material.

Felt Marker

A new concept in felt markers, Liqua-Tip, made by Blaisdell Pencil Co., Dept. GS, Bethayres, Pa., has the long look and feel of a pen, the convenience of a felt-tip marker. Features include: eight colors, pocket clip, cap storage, king-size ink supply.

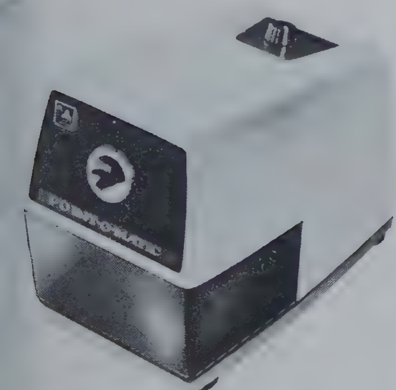
Office Copier

A new office copier combining light exposure and ready-to-use developer to provide permanent bond quality copies of any original, regardless of color, is on the market. The manufacturer is Photostat Corp., Dept. GS, 1001 Jefferson Rd., Rochester 3, N. Y. The Photostat Copier "14" produces copies 14″ wide and any length, is a companion to the Photostat Copier "9".



udio Graphic System

A synchronized sound and slide resentation intended for training of ew personnel; teaching of equip- ment repair and adjustment; safety raining; personnel testing, etc., is ow available from Graflex, Inc., Dept. GS 114, Rochester 3, N. Y. One advantage of this system is the ase with which companies can pre- are their own Audio Graphic pro- rams. Recording is done on the basic nit. A 35 mm. camera is used to repare the slides.



Electric Pencil Sharpener

A new automatic pencil sharpener alled Point-O-Matic is now available. Made by Matsushita Electric Corp. of America, Dept. GS, 41 East 42 St., New York, N. Y., the sharpener as several good features: a dial to elect point—from broad to fine— desired; suction cups to prevents lipping; automatic indicator which ights up when point is sharpened; ealed-in motor to prevent clogging rom scraps; ball bearings which liminate need for oiling.

Pencil Pointer

A pencil pointer with several new features is now being made by Best Yet Products, Dept. GS, 10719 S. Rhodes, Chicago 28, Ill. Priced at 70¢ each, the pointers have permanent abrasive strips, both fine pointing and fast pointing, with pressure-sensitive adhesive backing; convenient sponge rubber tips; a base of 20 ga. anodized aluminum.

Automatic Diazo Developer

A completely new diazo print de- veloper has been announced by Roto lite Sales Corp., Dept. GS, Stirling, N. J. The Rotolite Thermomatic features a heated roller which speeds up the action of the ammonia developer and produces for the first time on low cost whiteprinters completed development on black line prints and sepias. Prints up to 42" wide are developed at a rate of 48" a minute. Thermomatic weighs only 30 lbs., is designed for wall mounting.

Parallel Straightedge

A new parallel straightedge, featuring an exclusive locking device that prevents up-and-down drift and accidental misplacement, has been introduced recently. Made by Keuffel & Esser Co., Dept. GS, Third and Adams Sts., Hoboken, N. J., the Jacob's Parallel Straightedge can be locked on a drawing board, freeing the draftsman's hands to work with lettering equipment, triangles, protractors, and other instruments. It is claimed this straightedge maintains perfect accuracy even when making adjustments to base lines slightly off the horizontal.

New Literature

'he 200 Streamliner Whiteprinter is described in a bro-hure published by the Ozalid Div., Dept. GS, General naline & Film Corp., 516 Corliss Lane, Johnson City, ·. Y. The whiteprinter and accessories are fully described ı the two-color brochure, which lists engineers, archi-ects, surveyors, schools, government agencies, and manu-acturers as users of the machine. Also described: the lternate front and rear stacking trays, new cooling sys-em, and fatigue-reducing control layout.

'ransograph Contak Shading Film is the subject of a -page illustrated booklet. The manufacturer, Transo-raph, a division of Chart-Pak, Inc., Dept. GS, Leeds, lass., describes advantages of Contak Shading Film, ow on Mylar. Among the advantages: heat resistant, asy to use, adaptable for use with all diazo equipment nd for projection by transmitted or reflected light, self-dhesive.

'he Xerox 914 Office Copier is described in a new book-et from Xerox Corp., Dept. GS, Haloid St., Rochester 3, ·. Y. What the manufacturer calls a fundamental new vay of office copying is explained and pictured in the -page booklet.

'utting Engineering Data Cost With Microfilm is the itle of an 8-page illustrated brochure describing the time nd dollar savings made by an engineering data micro-lm system at Collins Radio Co. The brochure, reprinted rom a recent trade publication article, describes the utomatic retrieval and distribution of some 2,000 to ,000 engineering drawings daily at the Collins main lant in Cedar Rapids, Iowa. Available free by writing)ept. Sl-474-GS, Minnesota Mining & Manufacturing 'o., 900 Bush Ave., St. Paul 6, Minn.

'isual Aids for Drafting Rooms is the title of a 4-page ooklet issued by O. A. Olson Manufacturing Co., Dept. 'S, 712 Tenth St., Ames, Iowa. The company, manu-acturer of the Ames Lettering Instrument, offers de-criptions in the booklet of transparent projection boxes nd accessories and of a 3′ x 6′ wall chart of U.S. stand-rd system of letters and numbers.

)rafting Instruments and Templates are described, pic-ıred, and priced in a new price list issued by Dolgorukov lanufacturing Co., Dept. GS, 407 Fisher Bldg., Detroit , Mich. Included in the 8-page list: lettering instruments, iangles, curves, templates, T-squares, straight edges, ıd sweeps.

he Role of Microfilm in three government agencies is escribed in three booklets available free by writing linnesota Mining & Manufacturing Co., Dept. Sl-417-S, 900 Bush Ave., St. Paul 6, Minn. The brochures escribe the use of microfilm at the Social Security Ad-inistration, the U.S. Bureau of Public Debt, and the .S. Army Finance Center.

Tracing Paper Characteristics is the name of a 16-page booklet covering manufacturing processes, materials selection, and rigid control procedures in the production of quality tracing papers. The illustrated booklet has been published by Charles Bruning Co., Inc., Dept. GS, Mount Prospect, Ill., would be of interest to tracing paper users who want an explanation of the key steps in the manufacture of fine papers and their relation to the finished product. The book also outlines quality control procedures.

A New Six-Page Brochure on Electronic Enlargers has just been published by LogEtronics, Inc., Dept. GS, 500 E. Monroe Ave., Alexandria, Va. The enlargers, designed to provide superior print quality and consistency at lower cost, are described with detailed dimensional and application specifications. In addition to an illustrated explanation of how the enlarger works, five simple steps for making LogEtronic prints are given. Copies are available by writing the company.

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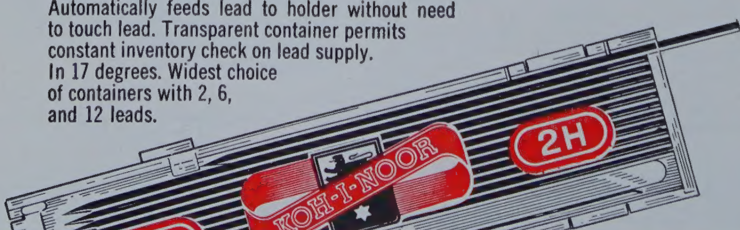

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